



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
SR-6J

MEMORANDUM

DATE: APR 20 2000

SUBJECT: National Remedy Review Board Recommendations for the Sheboygan River and Harbor Superfund Site

FROM: William E. Muno, Director
Superfund Division

A handwritten signature in black ink, appearing to read "Wm. E. Muno", is positioned to the right of the "FROM:" line.

TO: Bruce K. Means, Chair
National Remedy Review Board

Purpose

Region 5 appreciates the time spent by the National Remedy Review Board (NRRB) and thanks them for their recommendations and comments for the Sheboygan River and Harbor Superfund site. This response will be part of the Administrative Record for the site.

NRRB Comments

In presenting its proposal to the board, the region did not present data or analyses that show how the sediment disturbances would result in unacceptable risks. The board recommends that the region conduct such analyses and/or present this information in the proposed plan and record of decision for this clean up plan. If the risks are unacceptable, the region should better explain how the various alternatives address these risks. In particular, the region should describe how the preferred alternative adequately reduces risk from keel grounding. In particular how dredging a deep channel from the harbor to the bridge in zones A, B, C, and D, but taking no action near shore reduces risk.

Also, because boat traffic in the inner harbor river segment could redistribute contaminated sediment, the Region proposes to dredge a narrow channel and use institutional controls to prevent boaters from disturbing sediment in other parts of the river. The board appreciates the Region's goal of designing a cleanup plan to permit full use of the river by all boat traffic. However, the board recommends that the Region also consider alternatives that provide greater reliability over time and that require less care to maintain. For example, the Region might consider shallower, but shore-to-shore dredging in all, or selected, areas to permit full use of the River by the vast majority of

boaters. Such alternatives would eliminate the need for future precision re-dredging of the channel and eliminate the need for institutional controls beyond the narrow channel. Further, such alternatives may result in significant cost savings when compared to the proposed remedy. In addition, the region should consider an alternative that focuses on “hot spot only” removal, which may also reduce the overall contaminant remobilization predicted to occur from future navigational dredging actions.

Region 5 Response

The Proposed Plan released for public comment in May 1999 identified Lower River and Inner Harbor Alternative 5, Inner Harbor Sediment Removal - Safe Navigational Depth as the preferred alternative for the sediment remediation in the Lower River and Inner Harbor. Under this alternative, approximately 100,000 cubic yards of contaminated sediment between the Pennsylvania Avenue Bridge and the Inner Harbor mouth would be dredged. The removal of this sediment would create a 10 to 12 foot channel for recreational boats to travel in without disturbing contaminated sediments from either keel grounding or prop wash. The estimated cost of this alternative was \$26,900,000.

The remedy was preferred over the other possible Lower River and Inner Harbor alternatives because it provided the best overall balance of nine criteria based on the information available at the time. Removing contaminated sediments that were anticipated to be disturbed by boat traffic would allow surficial sediments in the Inner Harbor to reach the PCB sediment target of 1.0 ppm. The previous PCB sediment target of 1.0 ppm has been reduced to 0.6 ppm due to revised risk assessment calculations. The 0.6 ppm target equates to a human health risk of 1.0×10^{-4} .

The 10 to 12 foot channel depth was determined based on information obtained from the City of Sheboygan and the U.S. Coast Guard through NOAA. According to the City of Sheboygan, the largest recreational vessels using the Inner Harbor required a water depth of 10 feet. In addition, the U.S. Coast Guard recommended a 2 foot buffer between the maximum depth necessary and harbor bottom for navigational purposes. Dredging to a depth of 12 feet exposes more highly contaminated sediments, therefore in order to allow for a 12 foot water depth and not leave highly contaminated sediments exposed, the channel would be over dredged an additional 2 feet and backfilled with 2 feet of clean sediment. This would create a 2 foot sediment cap between the contaminated sediment and the maximum water depth necessary. This 2 foot natural cap would also allow for future maintenance dredging without disturbing PCB-contaminated sediments.

During the public comment period more detailed information was obtained from the City of Sheboygan concerning the types of boats likely to use the harbor and their sizes. This information is presented in Table 1. According to the new, more detailed information nearly all of the motor and sailboats require approximately 7 feet of water depth. Only a small percentage of the largest sailboats need the 10 feet previously used in determining the dredging depth.

Table 1 - Inner Harbor Recreational Boat Stats

Water Depth	Motor Boats	Sail Boats
10 feet	99.9%	99.9%
7 feet	99.9%	95%
5 feet	80%	70%

According to Figure 1, most of the Inner Harbor is navigable for nearly all of the boats likely to travel through it. This is not to say that the previously proposed dredging of the Inner Harbor was for the purposes of navigation, but the less navigable the harbor is the more significant boats traveling through the harbor would disturb contaminated sediments. Since only a few of the largest sail boats would be creating any deep keel disturbances down to 10 feet it's unlikely that those relatively few occurrences would significantly affect the over all surface sediment PCB concentrations over time.

Therefore, the boat traffic most likely to disturb sediments would be the smaller sail boats or motor boats. Since the majority of the water between the Pennsylvania Avenue and 8th Street Bridges is not much more than 7 feet deep, we expect sediment disturbance by these smaller craft.

A prop wash analysis submitted during the public comment period demonstrated that the top foot of sediment could be disturbed by motor boats. This analysis was reviewed by the USACE which concurred with the general conclusions. One underlying assumption of the prop wash analysis was a minimum water depth of 5 feet. Areas of the Inner Harbor near the Pennsylvania Avenue Bridge and 8th Street Bridge routinely have less than 5 feet of water which would mean that sediment in these areas may see prop wash disturbances beyond the top foot. The prop wash analysis also noted that the effects of high flow



events would have a greater potential impact on surface sediment, than prop wash effects. The USACE concurred with this assessment.

Based on the concern that high flow events would disturb sediment at greater depths than recreational boats, a bathymetry analysis was performed. Inner Harbor bathymetric maps, as far back as 1979, were reviewed to determine if the Inner Harbor is primarily depositional in nature and to see what effects, if any, a number of high flow events within the last few years have had on the sediment surface of the Inner Harbor.

An analysis of bathymetric surveys produced by the USACE, showed that over the last 20 years, the Inner Harbor has been primarily depositional in nature with over 185,000 cubic yards of additional sediment. See Figure 2. However, relatively little deposition has occurred between the Pennsylvania Avenue and 8th Street Bridges since 1991. In fact, some areas have undergone as much as 3 to 4 feet of scour. On the other hand, since 1991 up to 3 to 4 feet of additional deposition has occurred between the 8th Street Bridge and the Inner Harbor mouth

Cutting the 20 year period into shorter time intervals reveals that deposition and scour is scattered and

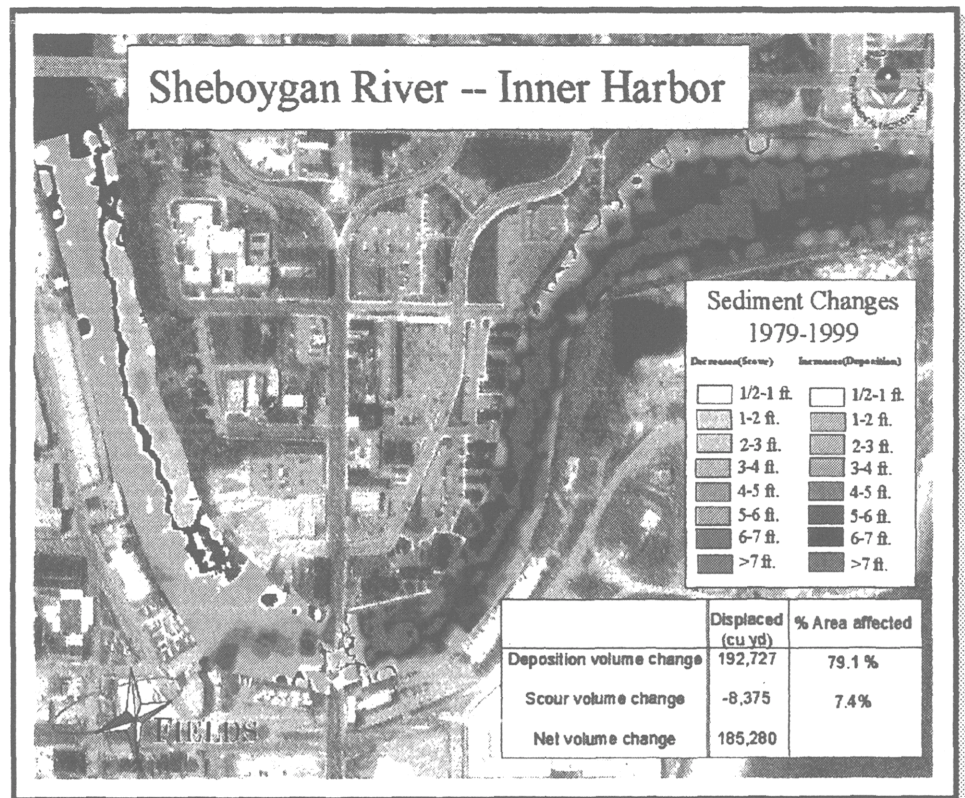


Figure 2

sometimes cyclical. Areas scoured one year get filled in the next and visa versa. Between 1997 and 1998, a significant portion of the entire Inner Harbor under went scour of up to 2 feet. Between 1998 and 1999 scour and deposition areas were less significant. Based on the review of Inner Harbor bathymetric maps, burial of contaminated sediments will not be significant between the Pennsylvania Avenue and 8th Street Bridges or approximately 45 percent of the Inner Harbor. Between the 8th Street Bridge and Inner Harbor mouth water depths are generally 10 feet or greater and additional deposition is expected to continue to occur.

In addition to looking at what areas of the Inner Harbor are likely to continue to be depositional and what areas are not, the EPA re-evaluated the PCB sediment data for the harbor. Previous PCB concentration estimates by U.S. EPA hadn't accounted for

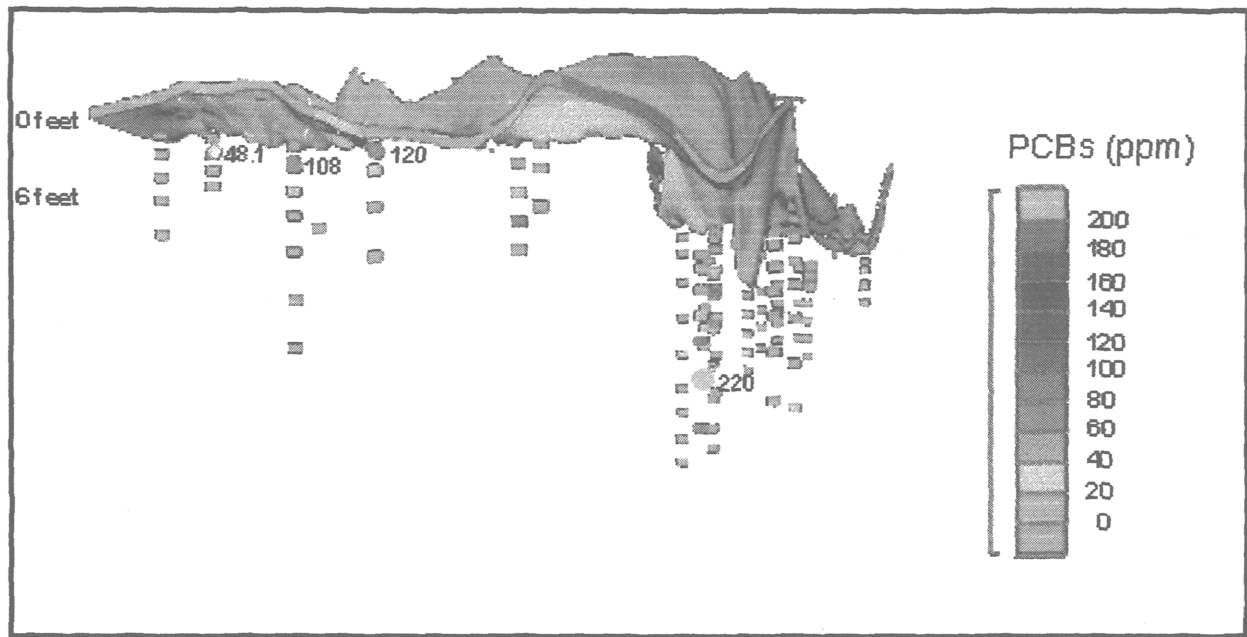
bathymetry changes over time. To correct this, Region 5 took all the Inner Harbor sediment data and tied the data to the bathymetry of the year the data was collected. For example, 1979 data was tied to the 1979 bathymetry while 1999 data was tied to the 1999 bathymetry. What this exercise did was reposition sediment core data within the entire sediment bed to more accurately locate PCB concentrations at depth.

Using the repositioned data, Region 5 re-extrapolated PCB concentrations throughout the entire Inner Harbor. PCB concentrations were more uniform, on average, between the Pennsylvania Avenue and 8th Street Bridges, while PCB concentrations, on average, increased with depth between the 8th Street Bridge and Inner Harbor mouth. (See Table 2)

Table 2 - PCB Concentrations At Various Depths in the Inner Harbor									
Sediment Depth	Entire Inner Harbor			Penn. Avenue to 8 th St.			8th St. to Harbor Mouth		
	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.
0 to 1 foot	6.5	ND	117.4	11.8	ND	117.4	1.3	ND	9.5
1 to 2 feet	7.9	ND	89.1	15.7	ND	89.1	2.4	ND	15.1
2 to 4 feet	10.7	ND	103.2	19.1	ND	103.2	4.8	ND	37.3
4 to 6 feet	13.6	ND	82.5	20.2	ND	82.1	8.9	ND	82.5
6 to 8 feet	16.3	ND	135.2	20.0	ND	92.0	13.8	ND	135.2
8 to 10 feet	18.8	ND	167.4	19.0	ND	99.9	18.7	ND	167.4
10 to 12 feet	20.8	ND	148.4	19.0	ND	109.5	22.1	ND	148.4
12 to 14 feet	23.4	ND	173.7	22.2	ND	105.2	24.2	ND	173.7

Looking more specifically at the sediment core data reveals why, on average, PCB concentrations are more uniform between the Pennsylvania Avenue and 8th Street Bridges. It's not that throughout this entire area PCB concentrations are uniform, but that at different locations higher levels of PCB concentrations can be found at various depths. This is shown in Figure 3.

Figure 3, on the following page, is a look at the sediment column data looking from west to east and slightly underneath the 1999 Inner Harbor sediment surface. Figure 3 shows that repositioned sediment column data indicates relatively high levels of PCBs near the surface of the Inner Harbor between the Pennsylvania Avenue and 8th Street bridges.



Based upon the repositioned data cores, PCB sediment concentrations of 48 ppm, 108 ppm and 120 ppm are within the top few feet of the sediment surface. Other sediment core data between the Pennsylvania Avenue and 8th Street bridges show high levels of PCBs at various depths. When all of these cores are combined the average PCB concentrations at depth look relatively uniform between the two bridges.

Repositioning of the sediment core data to account for changes in bathymetry over time, reveals that high levels of PCBs are near the sediment surface between the Pennsylvania Avenue and 8th Street Bridges. This is different from PCB concentration distributions between the 8th Street Bridge and the Inner Harbor mouth where continual sediment deposition has created a situation where PCB concentrations increase with depth.

Lastly, Region 5 evaluated the conditions that, if occurred, would constitute an unacceptable rise in PCB concentrations in surface sediments in the Inner Harbor. By using the approximate surface area of the Inner Harbor and the selected PCB sediment concentration of 0.6 ppm, a "trigger" was developed that if found could potentially result in an overall Inner Harbor surface sediment concentration of 2.0 ppm or over three times the targeted goal. Using site specific information, a PCB concentration of 51 ppm over an 8,400 ft² area would create a condition where the Inner Harbor surface area weighted concentration would be 2.0 ppm. Based on the repositioned sediment data, a number of locations between the Pennsylvania Avenue and 8th Street Bridges have PCB concentrations equaling or exceeding this trigger. Therefore, sediment near the surface contain PCB concentrations that if disturbed by recreational craft would cause an unacceptable rise in PCB concentrations in surface sediments based on the 0.6 ppm target.

Conclusions

Taking into account the more detailed information concerning the boats likely to use the harbor, prop wash disturbance impacts, deposition and scour trends from the bathymetry analysis, repositioned PCB concentration estimates at depth, and the comments raised by the NRRB, the selected Inner Harbor remedy has been revised to the shore-to-shore removal of the top two feet of contaminated sediment, from the Pennsylvania Avenue Bridge to just past the 8th Street Bridge which is depicted as Area A in Figure 4. PCB-contaminated sediment in Area A will continue to be disturbed by boat traffic and/or scour.

In addition, PCB concentrations within the top 2 feet of Area A are high enough to keep the Inner Harbor from reaching a SWAC of 0.6 ppm. Area A represents about 45 percent of the Inner Harbor and with very little additional deposition likely to occur in this area, the remaining 55 percent of the Inner Harbor would have to reach PCB concentrations near non-detect levels in order for the entire Inner Harbor to average 0.6 ppm overall.

Additional sediment removal will be necessary in those areas of the Inner Harbor where the bathymetry analysis shows scour greater than 2 feet. These areas are noted as Area B in Figure 5 and Area C in Figure 6. Figure 5 also shows what areas of the Inner Harbor that have less than 5 feet of water based on the low water datum.

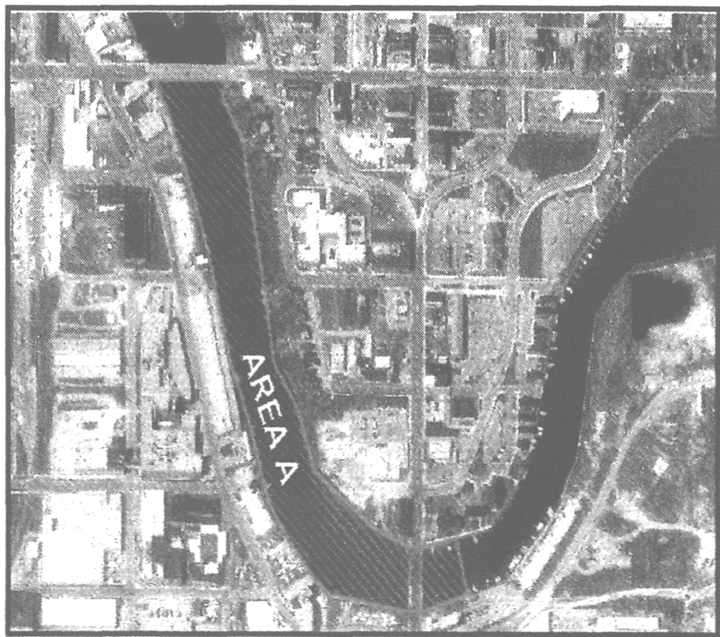


Figure 4



Figure 5

Re-characterization of PCB contamination may also reveal that areas between the 8th Street Bridge and the Inner Harbor mouth contain PCB concentrations above 50 ppm in areas historically vulnerable to scour or within the top foot of the sediment surface. Under these circumstances, additional “hot spot” PCB-contaminated sediment will be removed between the 8th Street Bridge and the Inner Harbor mouth.

Due to the continual disturbance of these sediments by boats and flow events, PCB concentrations in area A are not expected to decline significantly over time. In fact, Inner Harbor surface sediment concentrations of PCBs have not changed much over the last 12 years. PCB surface concentrations in 1987 ranged from 0.2 to 5.8 ppm, while samples taken in 1999 showed surface concentrations ranging from 0.4 to 5.3 ppm. Without the remediation of sediments in Area A, it is likely that the average Inner Harbor surface sediment PCB concentration will remain above 0.6 ppm and will continue to represent an excess risk for human health and the environment. The PCB concentration of 0.6 ppm equates to a human health risk of 1.0×10^{-4} .

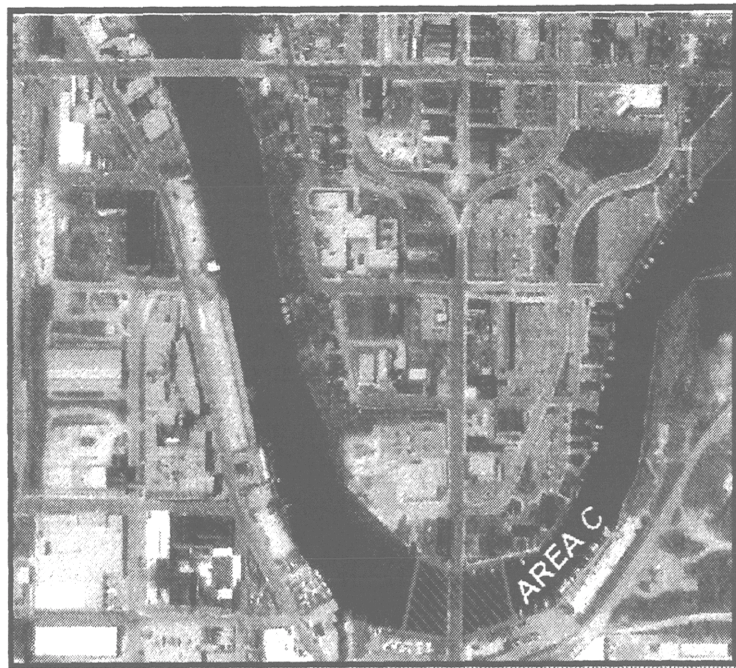


Figure 6

Based on all of this information and the comments and recommendations raised by the NRRB, the Inner Harbor Proposed Plan remedy which called for the excavation of approximately 100,000 yd³ for the development of a deep channel has been changed to the excavation of approximately 53,000 yd³ to remove shore-to-shore contaminated surface sediment likely to be disturbed and re-suspended from the majority of the boats using the harbor and/or from high flow events. Because the Sheboygan River is a public waterway, institutional controls to limit boat traffic to the deeper and less contaminated areas is highly improbable. Even if possible, any limits placed on the use of the Inner Harbor would be contrary to reuse initiatives within the Superfund program. All areas of the Inner Harbor that are excavated will be covered with clean sediment to provide a uncontaminated matrix for benthic organisms and a natural cap over the more highly contaminated sediments. The limited additional deposition in Area A will increase this natural cap over time.

The selected Inner Harbor remedy removes PCB-contaminated sediments that represent an imminent and substantial endangerment to human health and the environment at less than half the cost of the proposed plan remedy. The cost selected remedy is \$10.0 million versus the \$26.9 million proposed plan remedy and provides the best overall balance of nine criteria based on the information available to date.

Consistent with the proposed plan remedy, maintenance of the Outer Harbor breakwalls is still necessary in order to keep the most highly contaminated sediment in place. Like the other river segments, a long-term monitoring program will be implemented to assess natural processes (sediment and fish tissue levels) over time.

The selected remedy for the Inner Harbor addressed the comments and recommendations raised by the NRRB in July 1999. The Inner Harbor remedy combines a number of remedy approaches for the Inner Harbor including;

- Dredging (surficial and hot spot at depth)
- Natural Processes/Burial of lesser contaminated sediment
- Long-term Monitoring

If you have any questions, please do not hesitate to contact myself or Tom Short the project manager.